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CASE REPORT

DETECTION OF REPLACEMENT RESORPTION PATTERN IN AVULSED REPLANTED PERMANENT INCISOR BY USING CONE BEAM COMPUTED TOMOGRAPHY. A CASE REPORT

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ABSTRACT:

Root resorption is common, with a reported prevalence of 57-80%. Several techniques have been developed recently for precise and accurate radiographic assessment. Cone Beam Computed Tomography (CBCT) technology has been specifically designed to produce three dimensional scans of the maxillo-facial skeleton. The aim of present case report is to develop a reasonable depiction of replacement resorption pattern using Cone Beam Computed Tomography.

Key words: Avulsion, CBCT, root resorption.

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INTRODUCTION:

An avulsion injury leads to serious assault on the supporting tissues of tooth; complicating sequelae may result in root resorption. Root resorption is common, with a reported prevalence of 57-80%.[1,2-5] In the classical classification of root resorption following traumatic injuries, replacement and inflammatory resorption are considered with completely different etiologies and treatment protocols.[3] The development of replacement resorption depends on both the degree of damage to the periodontium at the time of injury, and the extent to which the viability of the periodontal ligament cells remaining on the root surfaces are maintained.[6]

The development of inflammatory root resorption is directly related to damage of the periodontium at the time of trauma, and the presence of bacteria within the root canal and dentinal tubules.[6] Resorption pattern can be challenging to diagnose correctly. One of the major problems with diagnosing and predictably managing inflammatory and replacement root resorption is that intraoral radiographs only reveal limited diagnostic information. Intraoral radiograph is incomplete due to the fact that the three-dimensional anatomy of the area being radiographed is compressed into a two-dimensional image or shadowgraph.[7] In addition; anatomical noise may result in an underestimation of the actual size of the resorption lesion.

Cone Beam Computed Tomography (CBCT) technology has been specifically designed to produce three dimensional scans of the maxillo-facial skeleton.[8,9]

The purpose of this case report is to develop a realistic picture of replacement resorption pattern using Cone Beam Computed Tomography.

CASE REPORT:

A case was presented of a 12 year old boy, who sustained trauma to his mandibular lateral incisor in a fall from his bicycle that leads to avulsion of tooth. The avulsed tooth had been left dry for around 2 hours in an uncovered plastic container after the injury. The examination of the tooth revealed that the root surface was covered with dried remnants of periodontal ligament. Tooth was then cleaned to remove the necrotic periodontal tissues. Pulp space therapy was performed and intra-oral periapical radiograph was made. The avulsed tooth socket was cleaned of any debris or blood clot. The socket was made to bleed freshly. The tooth was then replanted into its socket and splinted for 7 days with a non rigid splint. A 5-day course of amoxicillin was prescribed. Then, the patient was recalled for follow-up visits. Unfortunately, the patient failed to attend scheduled appointments. The patient next attended, unscheduled, 1 year and 6 months later. Examination revealed no signs and symptoms of inflammatory root resorption but radiographic evidence of replacement root resorption was found.

Radiograph showed substitution of about 2 cm of apical root with bone. Radiograph only shows mesio-distal anatomical changes as it provides a two dimensional image. Whereas, the resorption variations are mostly in the bucco-lingual direction. A decision was made to perform CBCT (M/S Carestream Health Inc. CS9300) with three-dimensional reconstruction using "On Demand 3D App^{TM} software" to obtain a more precise location and definition of the pathological features of the resorption sites. CBCT was performed in all three dimensions- axial, saggital and cross-sectional together with three-dimensional rendered images.
The cross-sectional images showed, maximum replacement resorption on the buccal side of tooth, starting from the apical 1/3rd, approaching towards the cervical line and proximally. In three dimensional rendered images, multiple resorptive areas on the buccal aspect appeared as moth eaten with irregular border. Contrary to this lingual aspect showed minimal root resorption. The avulsed tooth got completely ankylosed; patient was told about the condition and explained about the consequences of the resorption process. Because the tooth was not mobile at that time therefore, the extraction was delayed and patient consent was taken for definitive treatment in the near future.

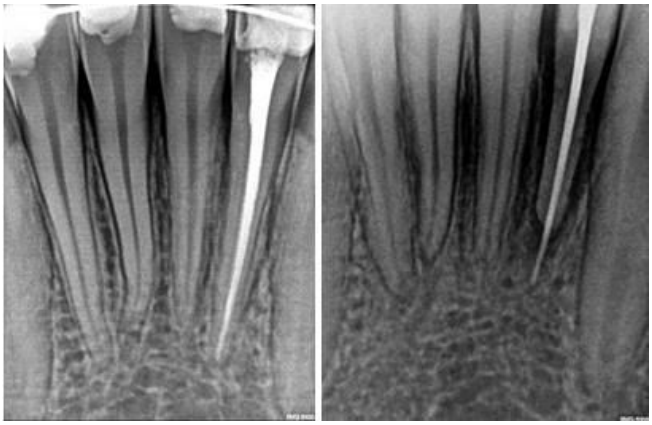

Figure 1a: Post-operative view; **1 b:** Two dimension radiographic view shows replacement resorption only in mesio-distal aspect.

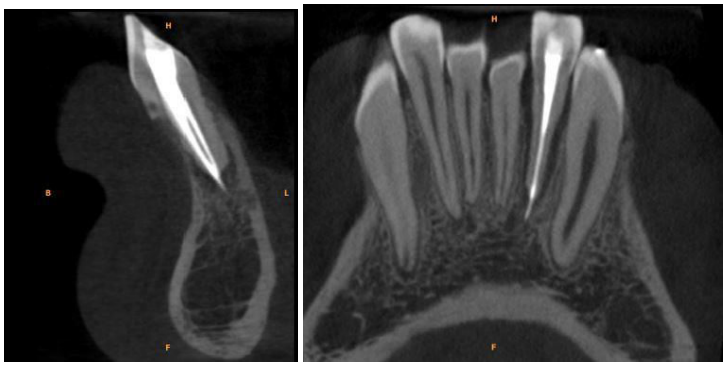

Figure 2: Three dimensional CBCT cross-sectional view shows replacement resorption both in mesio-distal as well as bucco-lingual aspect.

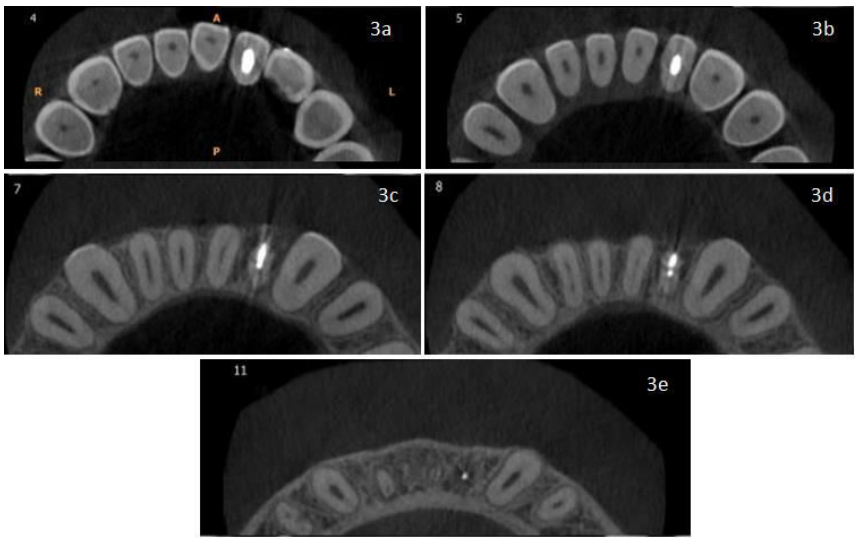

Figure 3: Axial CBCT images shows minimal resorption in 3a and 3b but as we move down apically (3c and 3d) replacement resorption is evident in buccal and proximal aspect and the last axial section apically (3e) shows only gutta-percha remnants completely embedded in substituted bone.

Figure 4: Three dimensional rendered images show multiple resorptive areas apically and buccally with irregular borders and gutta-percha appears as an integral part of the bone. Borders and gutta-percha appears as an integral part of the bone.

DISCUSSION:

In severe traumatic injuries (avulsion with extended dry time or intrusive luxation), injury to the root surface may be so large that healing with cementum is not possible, and the bone may come into contact with the root surface without an intermediate attachment apparatus. This phenomenon is termed as a dento-alveolar ankylosis.[10]

If less than 20% of the root surface is involved, a transient ankylosis may occur, which can later be resorbed due to functional stimuli, provided the tooth in the healing period is stabilized with a splint which allows a minimum amount of mobility, or is non-splinted.[11,12] In larger injuries (>4mm$_2$), a permanent ankylosis is created.

Clinically, the affected tooth is immobile, and exhibits a high percussive tone. Radiographically, the periodontal ligament space is absent, and a direct union is seen between alveolar bone and the root. In time, infra-occlusion relative to adjacent teeth can be seen both clinically and radiographically.[13]

In ankylotic/ replacement root resorption, there is no known stimulation factor; thus, no predictable treatment can be suggested.[10] In children, replacement resorption leads to loss of ankylosed teeth usually within 1-5 years. In adults, replacement resorption occurs more slowly, often allowing the tooth to function for many years.[11,12]

Studies found that dry time is the most crucial clinical factor associated with the development of post-replantation root resorption. Periodontal ligament cells can be expected to survive a dry time of 15 min or less [5], but are unlikely to survive a dry time of greater than 60 min.[14]. When a tooth has had an extra-oral dry time of greater than 60 min, the periodontal ligament is not expected to survive.[14] Pre-treatment of such a tooth, prior to its replanting, will render it more resistant to resorption. Traditionally, stannous fluoride has been used for the purpose [14,15] . If resorption is not detected within 2 years, the risk of resorption is considerably reduced.[16,17] Systemic antibiotics given at the time of replantation are recommended to prevent bacterial invasion of the necrotic pulp, thereby avoiding inflammatory resorption.[14,15]

Tooth resorption is a problem for dental practitioners, and early detection is important. Conventional radiographic images are frequently used to detect root resorption. However, apical shortening, lateral or cervical root gaps, enlargement of the root canal, and external root radiolucencies are typically not detectable on radiographs in the early stages when they are small or because of the limitations of this two-dimensional method. An alternative diagnostic tool for the early detection of root resorption is CBCT. It was used to detect root resorption in the present case report. Early detection can lead to timely intervention and better treatment outcomes. Root resorption extension is identified by analyzing all lesion dimensions; axial, transverse, and cross-sectional slices can be obtained using CBCT.[18]

CONCLUSION:

There is no predictable treatment available to stop replacement resorption in replanted tooth at present but our report present a three dimensional images of root resorption pattern, which can be a great and useful information for future studies.

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